AMENDED CLAIMS

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1. A method for changing the optical properties of a photomask for use in a photolithography process, the photomask, consisting of a substrate layer and a coating layer over the substrate layer, the method comprising:

providing a pulsed laser source for generating an ultra-short pulsed laser beam;

providing optical elements for scanning, directing and focusing the pulsed laser beam at a desired target location;

directing the pulsed laser beam through the substrate and focusing it on a target location located inside the substrate adjacent the coating layer to write a diffractive optical element, thus changing the scattering properties of the substrate at the target location.

2. The method as claimed in Claim 1, wherein the diffractive optical element is a shading element.

3. The method as claimed in Claim 1, wherein the diffractive optical element is a phase-shifting element.

4. The method as claimed in Claim 1, wherein the diffractive optical element comprises micro cracks in the substrate.

5. The method as claimed in Claim 1, wherein the diffractive optical element is produced by locally changing the refractive index of the substrate at the target location.

6. The method as claimed in Claim 1, wherein the pulsed laser source is an ultra-short pulsed laser source.

7. The method as claimed in Claim 6, wherein the ultra-short pulsed laser source is a femto-second laser source.

8. The method as claimed in Claim 1, wherein the diffractive optical element is produced in a tapered shape, the narrower end of the tapered shape being nearer the coating layer.

9. The method as claimed in Claim 8, wherein the diffractive optical element is conically shaped.

10. The method as claimed in Claim 8, wherein the diffractive optical element is pyramid-shaped.

11. The method as claimed in Claim 8, wherein the diffractive optical element having the tapered shape is made of layers of pixels, each layer consisting of an array of pixels patterned with a predetermined energy and density and geometry.

12. A system for changing the optical properties of a photomask for use in a photolithography process, the photomask consisting of a substrate layer and a coating layer over the substrate layer, the method comprising:

a pulsed laser source for generating an ultra-short pulsed laser beam;

optical elements for scanning, directing and focusing the pulsed laser beam at a desired target location within the substrate;

an in-situ machine vision system for viewing a field of view including the target location;

a control unit is provided for controlling and monitoring operation of the system,

whereby the system is capable of writing a diffractive optical element at a target location within the substrate adjacent the coating layer, thus changing the light scattering properties of the substrate at the target location.

13. The system as claimed in Claim 12, wherein the pulsed laser source is an ultra-short pulsed laser source.

14. The system as claimed in Claim 13, wherein the ultra-short pulsed laser source is a femtosecond laser source.

15. The system as claimed in Claim 12, wherein the pulsed laser source provides laser beam whose wavelength is made to range between 190 to 900 nm.

16. The system as claimed in Claim 12, wherein the in-situ machine vision system shares some of the optical elements, so that writing is directly viewed by the in-situ machine vision system.

17. The system as claimed in Claim 12, further including low magnification optics for locating and positioning of predetermined target location in the photomask in front of the pulsed laser beam.

18. The system as claimed in Claim 12, further provided with harmonics generator, and a variable attenuator for controlling output energy of the pulsed laser beam.

19. The system as claimed in Claim 12, provided with a scanner, for scanning the pulsed laser beam.

20. The system as claimed in Claim 19, wherein the scanner is selected from the group including: galvo-scanner, piezo-electrically actuated scanner, acousto-optic deflector.

21. The system as claimed in Claim 12, wherein a moving stage is provided for moving the photomask under the pulsed laser beam.

22. The system as claimed in Claim 21, wherein the moving stage is a 3-axis moving stage.

23. The system as claimed in Claim 12, wherein light source is provided for illuminating the photomask.

24. The system as claimed in Claim 23, wherein the light source is further provided with a light guide and a variable aperture stop.

25. The system as claimed in Claim 12, wherein the optical elements include beam-splitter, objective lens, tube-lens, condenser lens.

26. The system as claimed in Claim 12, further provided with a CCD camera, wherein an image recorded by the CCD camera is grabbed by a frame grabber and processed by the control unit to assess the optical properties of the photomask.

27. The system as claimed in Claim 26, wherein a computerized program is provided for determining the position, orientation and dimensions of a defect in the photomask.

28. The system as claimed in Claim 27, wherein the computerized program optionally converts the defect into a map of pixels.

29. The system as claimed in Claim 27, wherein the computerized program takes into account the dimensions and orientation of the defect, Fresnel diffraction, and the scattering nature of patterned pixels written by the pulsed laser source, to determine shape, orientation and position of the diffractive optical element.

30. A method for changing the optical properties of a photomask for use in a photolithography process, the photomask, consisting of a substrate layer and a coating layer over the substrate layer, substantially as described in the aforementioned specification and accompanying drawings.

31. A system for changing the optical properties of a photomask for use in a photolithography process, the photomask, consisting of a substrate layer and a coating

layer over the substrate layer, substantially as described in the aforementioned specification and accompanying drawings.